EFFECT OF PEER INSTRUCTIONAL STRATEGY ON ACADEMIC RETENTION OF SENIOR SECONDARY SCHOOL BIOLOGY STUDENTS IN ENUGU EDUCATION ZONE

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ABSTRACT
The study examined the effect of Peer Instructional Strategy (PIS) and expository method (EM) on the retention of Secondary School Biology Students. The purpose of the study was to investigate the effect of peer instructional strategy relative to expository method on the retention of secondary school Biology students. The area of the study was Enugu Education Zone of Enugu State. Two research questions and hypotheses guided the study. The study was a quasi-experimental research with pretest-posttest, non-equivalent groups research design; involving 528(227 male and 301 female senior secondary school 2 Biology students drawn from six randomly selected co-educational schools out of the ten secondary schools in Enugu Education zone that met the inclusion criteria. Two intact classes from each of the 6 schools were randomly assigned to either PIS or EM group by balloting. The instrument for the study was a researcher-made Biology Achievement Test (BAT), validated by three experts. Content validity was ensured using text blueprint. The Pearson's product moment correlation coefficient was used to carry out test-retest reliability of the instrument, r = 0.74. The BAT was administered 2 weeks after posttest. The results showed that PIS group significantly performed better than EM group in terms of academic level of retention. The researcher recommends PIS should be used in teaching and learning of Biology.

Keywords and Phrases: Peer Instruction, Teaching, Learning, Retention and Biology.

INTRODUCTION
Biology is a natural science that deals with the living world: how the world is structured, how it functions and what these functions are, how living things came into existence, and how they react to one another and with their environment (Umar, 2011). Biology as it were, is one of the core subjects in Nigerian secondary school curriculum. Biology is introduced to students at senior secondary school level as a preparatory ground for human development, where career abilities are groomed, and potentials and talents are discovered (Federal Republic of Nigeria, 2010). Despite the importance and popularity of biology among Nigerian students, performance at senior secondary school level has been poor (Ahmed, 2011). The poor retention of students in Biology in external examination can be linked to the use of Expository Method in teaching secondary school biology (Isiugo-

Abanihe, Long John and Ibiene, 2010). The knowledge of biology also helps us to know and understand sex determination and linkage, natural birth control and crime. Based on the importance of biology, a sound theoretical and practical knowledge and understanding of biological concepts and principles, are necessary for the well-being and technological advancement of a country like Nigeria (Offor, 2004). To achieve the goals of biology at secondary school, biologists and biology educators have concerned themselves with continuous search for better and effective methods, approach, strategies and models of teaching and learning that can make the study of biology more meaningful to the learner and thus enhance high retention of the facts (Ugwu, 2014).

In Nigeria the secondary school Biology curriculum is designed to encourage students to investigate into natural phenomena, to deepen students' understanding and retention in biological sciences, and to encourage students' ability to apply scientific knowledge to everyday life in matters of personal, community, health and agriculture among others (Federal Ministry of Education, FME, 2011). It is a very important science subject and a requirement for higher learning in a number of science-related professional courses like Medicine, Agriculture, and Pharmacy. It is a prerequisite subject for many fields of learning that contribute immensely to the technological growth of the nation (Ahmed, 2012). Its importance to human includes: A better understanding of how the human body functions, finding cures for diseases, saving endangered species which are on the verge of extinction, a better management of problems related to the environment and so on. (Lepeschkin, 2018).

Retention is an act of remembering things learnt or the ability to store information for a long time. The theoretical significance of this study is that it will provide opportunity for a better understanding that cognitive development takes place from the social interaction of the child. Which is in line with Vygotsky theory of intellectual development. The Vygostky theory of intellectual development holds that cognitive development takes place from the active interaction of the child with the social environment. Apart from the theoretical significance, the result of this study also has practical benefits. Practically, the findings of this study will hopefully be of immense benefit to biology teachers, students, authors, curriculum planners, the Government and the society at large. Summarily, this study establishes the efficacy of Peer Instructional Strategy (PIS) in enhancing students' retention in biology.

Ugwu (2014) stated that facts, principles and concepts are retained for a longer period if senses are used to put them across to students. In agreement with the above, Ogunsola-Banndele (2012) observed that students learn and retain more from Biology lesson by doing or participating actively rather than mere observation. A study carried out by Okogie (2001) cited by Aniodo, Offor and Ngozi (2012) noted that retention rates are lower for girls than boys in science. However, this work sought to find out if this finding is applicable in biology when taught with peer instructional strategy. Gender is another variable of interest in this study. There have been controversies in the retention of female and male students. While research findings of Ngwu (2010) showed that male students

perform more than the female students, the study carried out by Offer (2012) shows that females have equal capabilities with males in terms of retention and that there is no biological proof to show that the females are inferior to males. This study seeks to find out whether Peer Instructional Strategy has a different effect on male and female students.

Over the years, the academic retention of Biology students at secondary school has remained poor. This is perceived by many as the inability of the teachers to impart knowledge to the learners the way they will understand and write well in examinations. Several studies by scholars over the ages blame the state of affairs on the ineffective teaching methods, adopted by the teachers of Biology in Nigerian secondary schools. Biology teachers often adopt methods that are non-inspiring and largely ineffective, didactic, dull and non-result oriented, hence, many researchers in science education do not recommend their use in the senior secondary science teaching. There have been several researches on which method is better among traditional based and teacher centred instructional strategies such as peer instruction. Consequently, the exact comparative impact of the two instructional strategies on students' retention in Biology is yet to be established. Although evidence exists in favor of the peer instructional strategy of teaching, it cannot be successfully sustained without subjecting it to thorough empirical screening. The researchers in Biology and other science subjects are therefore challenged with the responsibility of verifying the effect of such instructional strategy on the students' retention in Biology. The question then is: would the peer instructional strategy of teaching biology bring about better retention in the subject at the secondary school level.

PURPOSE OF THE STUDY

The main purpose of this study is to investigate the effect of peer instructional strategy on the academic retention of secondary school Biology students. Specifically, the study seeks to determine: (a) The effect of Peer Instructional Strategy on secondary school students' retention in Biology when compared with Expository Method. (b) The difference in the mean retention scores of the male and female students taught with Peer Instructional Strategy.

RESEARCH QUESTIONS

To provide direction for this study, the following questions were formulated:

1. What is the mean difference between the retention scores of students taught with Peer Instructional Strategies and their counterparts taught with the Expository Method?

2. What is the mean difference between the retention scores of male and female students taught with Peer Instructional Strategies?

HYPOTHESES

The study was guided by the following hypotheses tested at 0.05 probability level.

Ho_1: There was no significant difference in the mean retention scores of male and female students taught with Peer Instructional Strategies.

Ho_2: There was no significant difference in the mean retention scores of male and female students taught with Expository Method.

METHOD

The study is a quasi-experimental research; specifically, Pre-Test-Post-Test Non-equivalent Groups research design was employed. The reason for using non-equivalent groups design is because the intact classes that were used have varying number of students. For this study, two levels of treatment conditions were used. These are Peer Instruction Strategy (PIS) and Expository method (EM). The PIS was used on one treatment group whereas, the EM was used for the other group. In terms of content basic instructional objectives and mode of evaluation, the PIS is identical to EM. The major difference is in the instructional activities.

Finally, data collected from the subjects was collated in Microsoft Excel spreadsheet and analysed with SPSS 25 software. The result was presented in tables and chats. Mean and standard deviation and mean difference (descriptive statistics) were used in answering the research questions while the null-hypotheses (H_0) 2-5 and 7-10 were tested using the independent samples t-test H0 1 and 6 were tested using Analysis of variance (ANOVA) with Turkey post hoc test and Bonferomi adjustment. Level of significance was set at $p \leq 0.05$. for all the null-hypothesis, if calculated p-value on the ANOVA or t-test is equal to or less than the critical value at 0. 05, the null hypothesis was not accepted, otherwise accepted since the accepted side of the study used Quasi-experimented design, ANOVA would have been the best statistical tool or testing the hypothesis. ANOVA & t-test are not appropriate statistical tools for testing hypotheses in this study.

RESULTS

Research question 1

What is the mean difference between the retention scores of students taught with Peer Instructional Strategies and their counterparts taught with the expository method?

Table 1: ANCOVA of differences in pretest, post EM and PIS retention scores

ANOVA variables	Degree of freedom	Mean squares	F-value	P-value
Between groups	2	5029.123	66.178	0.001*
Within groups	1053	75.993		
		Mean difference		P-value
Turkey Post Hoc Test				
Retention EM vs. Pretest		3.01		0.001*
Retention PIS vs. Pretest		8.13		0.001*
Retention PIS vs. Retention EM		5.11		0.001*

EM = Expository Method. PIS = Peer Instructional Strategy. (*) = significant p-value.

The result presented in table 1 shows the mean difference in the retention score of the students that was taught with EM and their counterparts taught with PIS. Relative to baseline (Pre-test), the EM group had retention of 3.01%, and the PIS group had retention of 8.13%. When the PIS group was compared with the EM group, the net mean difference was 5.11%.

Hypothesis 1

There will be no significant difference in the mean retention score of students taught with Peer Instructional Strategies when compared with Expository Method.

Table 2: ANOVA of differences in pretest, post EM and PIS retention scores

ANOVA variables	Degree of freedom	Mean squares	F-value	P-value
Between groups	2	5029.123	66.178	0.001*
Within groups	1053	75.993		
		Mean difference		P-value
Turkey Post Hoc Test				
Retention EM vs. Pretest		3.01		0.001*
Retention PIS vs. Pretest		8.13		0.001*
Retention PIS vs. Retention EM		5.11		0.001*

EM = Expository Method. PIS = Peer Instructional Strategy. (*) = significant p-value.

The result from ANOVA, presented in table 2 shows that there was a significant difference between the retention scores of those taught with PIS, EM and the baseline score ($F(2) = 66.178$, $p = 0.001$). The Turkey post hoc test showed that both PIS and EM retention scores were significantly higher than pretest ($p = 0.001$). However, those taught with PIS had a significantly better retention than their counterparts taught with EM ($p = 0.001$). The calculated p-value (0.001) is less than the set significant level ($p \leq 0.05$), therefore, the researcher rejects the null hypothesis. This implies that there is a significant difference in the mean retention score of students taught with Peer Instructional Strategies when compared with Expository Method.

Research question 2

What is the mean difference between the retention scores of male and female students taught with Peer Instructional Strategies?

Table 3: Retention scores of male and female students taught with PIS

Parameter (%)	N	Mean ± S.D	Mean Diff.	Net Mean Diff.
Males PIS Pre-test	114	60.16 ± 9.11		
			7.71	
Male PIS Retention	114	67.87 ± 8.20		0.37
Female PIS Pre-test	150	59.30 ± 9.14		
			8.08	
Female PIS Retention	150	67.38 ± 7.84		

EM = Expository Method. PIS = Peer Instructional Strategy.

The result presented in table 3 shows the mean retention score of the male and female students that was taught with PIS. Relative to baseline (Pre-test), the males had an improvement of 7.71% compared to the female that had an improvement of 8.08%, the net mean difference was 0.37%.

Hypothesis 2

There will be no significant difference in the mean retention scores between male and female students taught with Peer Instructional Strategies.

Table 4: Retention scores of male and female students taught with PIS

Parameter (%)	N	Mean ± S.D	Mean Diff.	Net Mean Diff.
Males PIS Pre-test	114	60.16 ± 9.11		
			7.71	
Male PIS Retention	114	67.87 ± 8.20		0.37
Female PIS Pre-test	150	59.30 ± 9.14		
			8.08	
Female PIS Retention	150	67.38 ± 7.84		

EM = Expository Method. PIS = Peer Instructional Strategy.

The t-test result in table 4 showed that there was no significant difference in the mean retention score of male and female students taught with PIS ($t = 0.471$, $p = 0.638$). The calculated p-value (0.638) was greater than the set significant level ($p \leq 0.05$), therefore, the researcher accepts the null hypothesis. It means that there is no gender difference within the PIS group and that sex of the students is not a significant covariate in the ANOVA result presented in table 4.

Summary of Findings

1. There is a significant difference in the mean retention scores of biology student taught with Peer Instructional Strategies when compared with Expository Methods.
2. There is no significant difference in the mean retention scores between male and female biology students taught with Peer Instructional Strategies

Effects of peer Instructional Strategies on Retention Ability of Biology Students

The findings of this study showed that PIS group had a significantly better retention than EM group ($F(2) = 66.178$. $p = 0.001$) after the ANOVA result that showed a significant difference scores the treatment, the Turkey post hoc test was applied to identify the pairs with a significant difference. The biology students in the PISA group had a better retention than pretest or the EM group. When controlled for gender, PIS group continued to have a significantly better retention scores than EM groups. Peer Instructional approach to practical work permits the students to employ all their senses in the learning process. In all science subjects including biology, peer instruction approach to practical work is crucial to high understanding of the subjects.

CONCLUSION

The following conclusion was made based on the result of the findings

1. Peer Instructional Strategy improves the level of retention of knowledge in both male and female secondary school biology students better than the expository method.
2. There is no gender difference in the level of retention of knowledge among biology students taught with peer instructional strategy.

RECOMMENDATIONS

Based on the findings, the following recommendations were made:

1. Biology teachers in Secondary schools, should be trained to adopt PIS teaching method in other to enhance learning and improve retention of knowledge among their students.
2. Teachers should be encouraged by the government to use PIS in teaching Biology in secondary schools.
3. Curriculum developers should consider the concept of PIS during content brake down in other to make room for PIS.
4. State holders of Education should organize seminars and workshops to train teachers on the use of PIS for effective instruction and improved retention in biology.

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